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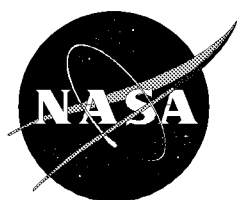
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NASA/SP—2000-7011/SUPPL501  
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- |           |   |           |
|-----------|---|-----------|
| <b>51</b> | <b>Life Sciences (General)</b>  | <b>1</b>  |
|           | Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see <i>categories 52 through 55</i> .  |           |
| <b>52</b> | <b>Aerospace Medicine</b>   | <b>3</b>  |
|           | Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see <i>53 Behavioral Sciences</i> . For the effects of space on animals and plants see <i>51 Life Sciences</i> . |           |
| <b>53</b> | <b>Behavioral Sciences</b>  | <b>7</b>  |
|           | Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.  |           |
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Subject Term Index	ST-1
Author Index	PA-1

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# Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

## Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
6. Report Number(s); Availability and Price Codes
7. Abstract
8. Abstract Author
9. Subject Terms



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# AEROSPACE MEDICINE AND BIOLOGY

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*A Continuing Bibliography (Suppl. 501)*

JUNE 2000

## 51

### LIFE SCIENCES (GENERAL)

*Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.*

20000044897 Rutherford Appleton Lab., Chilton, UK

**Structure of Immunoglobulin A, a Biological Macromolecule**

Perkins, S. J., University Coll., UK; The Rutherford Appleton Laboratory ISIS Facility Report 1998-99; August 1999, pp. 46-47; In English; See also 20000044882; Original contains color illustrations; Copyright; Avail: Issuing Activity

Antibody or immunoglobulin molecules play a critical role in our body's immune defense against bacteria and viruses. Immunoglobulin A (IgA) is not only present in blood but is also the predominant antibody class found in the mucosal surfaces of the lung and the gastrointestinal tracts, so forms a critical first line of defence against many invading pathogens. However, despite the abundance and importance of IgA, surprisingly little is known about the three-dimensional structures of the different IgA forms and how these relate to their unique roles in immunity. Small-angle diffraction using neutrons or X-rays is an ideal means to determine their solution structures; measurements on LOQ are helping to reveal the intermolecular arrangement and this in turn provides a better understanding of IgA's functional properties.

Author

*Antibodies; Immune Systems; Immunology; Bacteria; Viruses; Antigens*

20000053866 International Atomic Energy Agency, Vienna Austria

**Optimization of production and quality control of therapeutic radionuclides and radiopharmaceuticals: Co-ordinated research project 1994-1998 *Final Report***

Sep. 30, 1999; 99p; In English

Report No.(s): DE99-635805; IAEA-TECDOC-1114; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The 'renaissance' of the therapeutic applications of radiopharmaceuticals during the last few years was in part due to a greater availability of radionuclides with appropriate nuclear decay properties, as well as to the development of carrier molecules with improved characteristics. Although radionuclides such as P-32, SR-89 and I-131, were used from the early days of nuclear medicine in the late 1930s and early 1940s, the inclusion of other particle emitting radionuclides into the nuclear medicine armamentarium was rather late. Only in the early 1980s did the specialized scientific literature start to show the potential for using other beta emitting nuclear reactor produced radionuclides such as Sm-153, Ho-166, Dy-165 and (sup 186-188)Re. Bone seeking agents radiolabelled with the above mentioned beta emitting radionuclides demonstrated clear clinical potential in relieving intense bone pain resulting from metastases of the breast, prostate and lung of cancer patients. Therefore, upon the recommendation of a consultants meeting held in Vienna in 1993, the Co-ordinated Research Project (CRP) on Optimization of the Production and quality control of Radiotherapeutic Radionuclides and Radiopharmaceuticals was established in 1994. The CRP aimed at developing and improving existing laboratory protocols for the production of therapeutic radionuclides using existing nuclear research reactors including the corresponding radiolabelling, quality control procedures; and validation in experimental animals. With the participation of ten scientists from IAEA Member States, several laboratory procedures for preparation and quality control were developed, tested and assessed as potential therapeutic radiopharmaceuticals for bone pain palliation. In particular, the CRP optimized the reactor production of Sm-153 and the preparation of the radiopharmaceutical Sm-153-EDTMP (ethylene diamine tetramethylene phosphorate), as well as radiolabelling techniques and quality control methods for the preparation of Sm-153-hydroxyapatite, Sm-153 and Ho-166-microspheres and Ho-166-ferric-hydroxy-

macro-aggregates for the treatment of rheumatoid arthritis. The laboratory protocols included in the report were developed and thoroughly assessed and tested by the participants during the course of the CRP. These procedures are considered effective as well as simple to follow by anyone wishing to embark on the production and preparation of the above therapeutic radionuclides and radiopharmaceuticals for bone pain palliation and synovectomy applications.

NTIS

*Production Management; Quality Control; Nuclear Research; Radiation Protection; Radiation Therapy*

20000056045 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

**Cooperative Mission Concepts Using Biomorphic Explorers**

Thakoor, S., Jet Propulsion Lab., California Inst. of Tech., USA; Miralles, C., AeroVironment, Inc., USA; Martin, T., Jet Propulsion Lab., California Inst. of Tech., USA; Kahn, R., Jet Propulsion Lab., California Inst. of Tech., USA; Zurek, R., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 2p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Inspired by the immense variety of naturally curious explorers (insects, animals, and birds), their wellintegrated biological sensor-processor suites, efficiently packaged in compact but highly dexterous forms, and their complex, intriguing, cooperative behavior, this paper focuses on "Biomorphic Explorers", their definition/classification, their designs, and presents planetary exploration scenarios based on the designs. Judicious blend of bio-inspired concepts and recent advances in micro-air vehicles, microsensors, microinstruments, MEMS, and microprocessors clearly suggests that the time of small, dedicated, low cost explorers that capture some of the key features of biological systems has arrived. Just as even small insects like ants, termites, honey bees etc working cooperatively in colonies can achieve big tasks, the biomorphic explorers hold the potential for obtaining science in-accessible by current large singular exploration platforms.

Author

*Microprocessors; Microinstrumentation; Biological Effects; Animals; Insects*

20000056071 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

**From Coexpression to Coregulation: An Approach to Inferring Transcriptional Regulation Among Gene Classes from Large-Scale Expression Data**

Mjolsness, Eric, Jet Propulsion Lab., California Inst. of Tech., USA; Castano, Rebecca, Jet Propulsion Lab., California Inst. of Tech., USA; Mann, Tobias, Jet Propulsion Lab., California Inst. of Tech., USA; Wold, Barbara, California Inst. of Tech., USA; [2000]; 7p; In English; Sponsored in part by Whittier Foundation

Contract(s)/Grant(s): N00014-97-1-0422; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We provide preliminary evidence that existing algorithms for inferring small-scale gene regulation networks from gene expression data can be adapted to large-scale gene expression data coming from hybridization microarrays. The essential steps are (1) clustering many genes by their expression time-course data into a minimal set of clusters of co-expressed genes, (2) theoretically modeling the various conditions under which the time-courses are measured using a continuous-time analog recurrent neural network for the cluster mean time-courses, (3) fitting such a regulatory model to the cluster mean time courses by simulated annealing with weight decay, and (4) analysing several such fits for commonalities in the circuit parameter sets including the connection matrices. This procedure can be used to assess the adequacy of existing and future gene expression time-course data sets for determining transcriptional regulatory relationships such as coregulation.

Author

*Gene Expression; Genes; Genetic Code; Genetics; Biological Diversity; Deoxyribonucleic Acid; Ribonucleic Acids; Cells (Biology)*

20000056876 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

**Trainable Gene Regulation Networks with Applications to Drosophila Pattern Formation**

Mjolsness, Eric, Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 41p; In English; Original contains color illustrations  
Contract(s)/Grant(s): N00014-97-1-0422; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This chapter will very briefly introduce and review some computational experiments in using trainable gene regulation network models to simulate and understand selected episodes in the development of the fruit fly, *Drosophila melanogaster*. For details the reader is referred to the papers introduced below. It will then introduce a new gene regulation network model which can describe promoter-level substructure in gene regulation. As described in chapter 2, gene regulation may be thought of as a combination of cis-acting regulation by the extended promoter of a gene (including all regulatory sequences) by way of the transcription complex, and of trans-acting regulation by the transcription factor products of other genes. If we simplify the cis-action by using a phenomenological model which can be tuned to data, such as a unit or other small portion of an artificial

neural network, then the full transacting interaction between multiple genes during development can be modelled as a larger network which can again be tuned or trained to data. The larger network will in general need to have recurrent (feedback) connections since at least some real gene regulation networks do. This is the basic modeling approach taken, which describes how a set of recurrent neural networks can be used as a modeling language for multiple developmental processes including gene regulation within a single cell, cell-cell communication, and cell division. Such network models have been called "gene circuits", "gene regulation networks", or "genetic regulatory networks", sometimes without distinguishing the models from the actual modeled systems.

Derived from text

*Genes; Network Analysis; Drosophila; Computation; Gene Expression*

20000056895 Prins Maurits Lab. TNO, Rijswijk Netherlands

**Characterisation of Bacteria by Matrix- assisted Laser Desorption/Ionisation and Electrospray Mass Spectrometry *Final Report***

vanBaar, B. L.; Dec. 1999; 62p; In English

Report No.(s): AD-A372718; PML-1999-A83; TDCK-TD99-0176; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Chemical analysis for the characterisation of micro-organisms is rapidly evolving, after the recent advent of new ionisation methods in mass spectrometry: electrospray (ES) and matrix-assisted laser desorption/ionisation (MALDI). These methods allow quick characterisation of micro-organisms, either directly or after minimum sample preparation. This report provides a brief introduction to ES and MALDI mass spectrometry and a discussion of micro-organism characterisation capabilities. Some attention is devoted to the analysis of mixtures of proteins, lipids and other compounds, to the combination of polymerase chain reaction technology and mass spectrometry, and to the analysis of whole bacteria and their lysates. The review of results produced hitherto is concluded with an outlook on future developments.

DTIC

*Bacteria; Desorption; Ionization; Chemical Analysis*

20000057462 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

**Morphogenesis in Plants: Modeling the Shoot Apical Meristem, and Possible Applications**

Mjolsness, Eric, Jet Propulsion Lab., California Inst. of Tech., USA; Gor, Victoria, Jet Propulsion Lab., California Inst. of Tech., USA; Meyerowitz, Elliot, California Inst. of Tech., USA; Mann, Tobias, Jet Propulsion Lab., California Inst. of Tech., USA; [1998]; 6p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A key determinant of overall morphogenesis in flowering plants such as *Arabidopsis thaliana* is the shoot apical meristem (growing tip of a shoot). Gene regulation networks can be used to model this system. We exhibit a very preliminary two-dimensional model including gene regulation and intercellular signaling, but omitting cell division and dynamical geometry. The model can be trained to have three stable regions of gene expression corresponding to the central zone, peripheral zone, and rib meristem. We also discuss a space-engineering motivation for studying and controlling the morphogenesis of plants using such computational models.

Author

*Gene Expression; Mathematical Models; Plants (Botany); Two Dimensional Models; Botany; Cells (Biology)*

## 52

### AEROSPACE MEDICINE

*Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.*

20000045690 NASA Johnson Space Center, Houston, TX USA

**Endothelium Preserving Microwave Treatment for Atherosclerosis**

Carl, James R., Inventor, NASA Johnson Space Center, USA; Arndt, G. Dickey, Inventor, NASA Johnson Space Center, USA; Fink, Patrick W., Inventor, NASA Johnson Space Center, USA; Beer, N. Reginald, Inventor, NASA Johnson Space Center, USA; Henry, Phillip D., Inventor, NASA Johnson Space Center, USA; Pacifico, Antonio, Inventor, NASA Johnson Space Center, USA; Raffoul, George W., Inventor, NASA Johnson Space Center, USA; Apr. 04, 2000; 24p; In English; Continuation-in-part of US-Patent-Appl-SN-641045, filed 17 Apr. 1996

Patent Info.: Filed 5 Aug. 1998; NASA-Case-MSC-22724-1; US-Patent-6,047,216; US-Patent-Appl-SN-129832; US-Patent-Appl-SN-641045; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Method and apparatus are provided to treat atherosclerosis wherein the artery is partially closed by dilating the artery while preserving the vital and sensitive endothelial layer thereof. Microwave energy having a frequency from 3 GHz to 300 GHz is propagated into the arterial wall to produce a desired temperature profile therein at tissue depths sufficient for thermally necrosing connective tissue and softening fatty and waxy plaque while limiting heating of surrounding tissues including the endothelial layer and/or other healthy tissue, organs, and blood. The heating period for raising the temperature a potentially desired amount, about 20 C., within the atherosclerotic lesion may be less than about one second. In one embodiment of the invention, a radially beveled waveguide antenna is used to deliver microwave energy at frequencies from 25 GHz or 30 GHz to about 300 GHz and is focused towards a particular radial sector of the artery. Because the atherosclerotic lesions are often asymmetrically disposed, directable or focussed heating preserves healthy sectors of the artery and applies energy to the asymmetrically positioned lesion faster than a non-directed beam. A computer simulation predicts isothermic temperature profiles for the given conditions and may be used in selecting power, pulse duration, beam width, and frequency of operation to maximize energy deposition and control heat rise within the atherosclerotic lesion without harming healthy tissues or the sensitive endothelial cells.

Official Gazette of the U.S. Patent and Trademark Office

*Arteriosclerosis; Microwave Frequencies; Endothelium; Softening; Sensitivity; Pulse Duration; Heating; Energy Transfer; Computerized Simulation; Clinical Medicine*

20000045712 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada

**Handbook of Airsickness for the Canadian Forces Air Navigation School (CFANS)**

Cheung, B., Defence and Civil Inst. of Environmental Medicine, Canada; Jan. 2000; 34p; In English

Report No.(s): AD-A375321; DCIEM-TR-2000-014; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Airsickness is a common occurrence among aircrew trainees, particularly during the initial training phase. It is well known that motion sickness afflicts the passenger far more than the driver of the vehicle. The objectives of this handbook are to assist student-navigators to dispel myths about airsickness, to recognize the mechanism of airsickness during their initial training, to provide some practical countermeasures and to propose future training strategies in order to minimize the impact of airsickness on operation. Although this handbook is written specifically for CFANS and the investigation into the specific cause of airsickness in navigators is based on the CT-142, other CF navigators, aircrew and flight surgeons may find some of the information useful as well.

DTIC

*Motion Sickness; Aerospace Medicine*

20000048263 NASA Johnson Space Center, Houston, TX USA

**Tubular Coupling**

Rosenbaum, Bernard J., Inventor, NASA Johnson Space Center, USA; Apr. 18, 2000; 6p; In English

Patent Info.: Filed 21 Sep. 1998; NASA-Case-MSC-22865-1; US-Patent-6,050,987; US-Patent-Appl-SN-157759; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A system for coupling a vascular overflow graft or cannula to a heart pump. A pump pipe outlet is provided with an external tapered surface which receives the end of a compressible cannula. An annular compression ring with a tapered internal bore surface is arranged about the cannula with the tapered internal surface in a facing relationship to the external tapered surface. The angle of inclination of the tapered surfaces is converging such that the spacing between the tapered surfaces decreases from one end of the external tapered surface to the other end thereby providing a clamping action of the tapered surface on a cannula which increases as a function of the length of cannula segment between the tapered surfaces. The annular compression ring is disposed within a tubular locking nut which threadedly couples to the pump and provides a compression force for urging the annular ring onto the cannula between the tapered surfaces. The nut has a threaded connection to the pump body. The threaded coupling to the pump body provides a compression force for the annular ring. The annular ring has an annular enclosure space in which excess cannula material from the compression between the tapered surfaces to "bunch up" in the space and serve as an enlarged annular ring segment to assist holding the cannula in place. The clamped cannula provides a seamless joint connection to the pump pipe outlet where the clamping force is uniformly applied to the cannula because of self alignment of the tapered surfaces. The nut can be easily disconnected to replace the pump if necessary.

Official Gazette of the U.S. Patent and Trademark Office

*Cardiovascular System; Cannulae; Clamps; Couples; Heart; Joints (Junctions); Self Alignment*

20000048494 National Bioethics Advisory Commission, Rockville, MD USA  
Research Involving Human Biological Materials: Ethical Issues and Policy Guidance, Volume 2, Commissioned Papers  
Jan. 2000; 260p; In English

Report No.(s): PB2000-104235; No Copyright; Avail: CASI; A03, Microfiche; A12, Hardcopy

Content include the following: Privacy and the Analysis of Stored Tissues; An Ethical Framework for Biological Samples Policy; Research on Human Tissue: Religion Perspectives; Stored Tissue Samples: An Inventory of Sources in the USA; Contribution of the Human Tissue Archive to the Advancement of Medical Knowledge and the Public Health; The Ongoing Debate About Stored Tissue Samples; and Mini-Hearings on Tissue Samples and Informed Consent.

NTIS

*Research; Policies; Genetic Engineering; Research Management; Public Health*

20000048498 Center for Mathematics and Computer Science, Amsterdam, Netherlands  
Mathematical Modelling in Blood Coagulation; Simulation and Parameter Estimation. Modelling, Analysis and Simulation

Stortelder, W. J. H., Center for Mathematics and Computer Science, Netherlands; Hemker, P. W., Center for Mathematics and Computer Science, Netherlands; Hemker, H. C., Center for Mathematics and Computer Science, Netherlands; Sep. 1997; 20p; In English

Report No.(s): PB2000-104702; MAS-R9720; Copyright; Avail: National Technical Information Service (NTIS)

This paper describes the mathematical modelling of a part of the blood coagulation mechanism. The model includes the activation of factor X by a purified enzyme from Russel's Viper Venom (RVV), factor V and prothrombin, and also comprises the inactivation of the products formed. In this study the authors assume that in principle the mechanism of the process is known. However, the exact structure of the mechanism is unknown, and the process still can be described by different mathematical models. These models are put to the test by measuring their capacity to explain the course of thrombin generation as observed in plasma after recalcification in presence of RVV. The mechanism studied is mathematically modelled as a system of differential-algebraic equations (DAEs). Each candidate model contains some freedom, which is expressed in the model equations by the presence of unknown parameters. For example, reaction constants or initial concentrations are unknown. The goal of parameter estimation is to determine these unknown parameters in such a way that the theoretical (i.e., computed) results fit the experimental data within measurement accuracy and to judge which modifications of the chemical reaction scheme allow the best fit. The authors present results on model discrimination and estimation constants, which are hard to obtain in another way.

NTIS

*Mathematical Models; Blood Coagulation; Simulation; Chemical Reactions; Numerical Analysis*

20000048617 Army Research Inst. of Environmental Medicine, Natick, MA USA  
Thermoregulatory and Immune Responses During Cold Exposure: Effects of Repeated Cold Exposure and Acute Exercise

Castellani, John W.; Young, Andrew J.; Sawka, Michael N.; Shek, Pang N.; Brenner, Ingrid K.; Mar. 2000; 105p; In English; Prepared in collaboration with the Defence and Civil Institute of Environmental Medicine, Toronto, Canada.

Report No.(s): AD-A375860; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Whether or not the thermoregulatory system fatigues (i.e., causes blunted shivering thermogenesis and vasoconstriction) during cold exposure is unknown. Thus, a series of experiments were executed to determine if serial cold water immersion or acute exertional fatigue would cause thermoregulatory fatigue during subsequent cold exposure. This information will be used in developing thermoregulatory models during cold exposure. During these studies several unanswered questions regarding thermoregulation in the cold were also addressed: (1) do thermoregulatory responses to cold show fatigue when prolonged cold water exposures are serially repeated? (2) are thermoregulatory effector responses to cold affected by time of day? (i.e., circadian influences); (3) does a single acute, fatiguing exercise bout impair thermoregulatory responses to subsequent cold exposure? and (4) does fatigue induced by severely strenuous physical activity compromise the immune response to cold exposure? The results of these studies suggest that: (1) serial cold water blunts shivering leading to lower core temperatures, (2) thermoregulatory effector responses are not affected by time of day, (3) exercise increases peripheral heat loss and lowers core temperature during subsequent cold exposure, and (4) that acute cold exposure has immunostimulating effects.

DTIC

*Temperature Control; Exposure; Physiological Responses; Thermoregulation; Water Immersion; Shivering*

20000052125 Civil Aeromedical Inst., Oklahoma City, OK USA

**The Evaluation of In-Flight Medical Care Aboard Selected US Air Carriers: 1996 to 1997 *Final Report***

Dejohn, Charles A., Civil Aeromedical Inst., USA; Veronneau, Stephen J. H., Civil Aeromedical Inst., USA; Wolbrink, Alex M., Civil Aeromedical Inst., USA; Larcher, Julie G., Civil Aeromedical Inst., USA; Smith, David W., Oklahoma Univ., USA; Garrett, Joan, MedAire, Inc., USA; May 2000; 32p; In English

Contract(s)/Grant(s): DTFA02-97-P-53665; AM-B-97-TOX-203

Report No.(s): DOT/FAA/AM-00/13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Medical care in-flight and the FAA-mandated medical kit have been studied for many years. This study includes a detailed correlation between in-flight medical care, patient response in-flight, and post-flight follow-up, in an effort to evaluate in-flight medical care delivery on US airlines and re-evaluate the FAA-mandated in-flight medical kit. A survey of five US domestic air carriers from October 1, 1996, to September 30, 1997, showed 1132 in-flight medical incidents. These airlines accounted for approximately 22% of scheduled US domestic enplanements during the period. There was good overall agreement between in-flight and post-flight diagnoses (70% of cases), and passenger condition improved in a majority of cases (60%), suggesting that in-flight diagnoses were generally accurate and treatment was appropriate. Results indicated that bronchodilator inhalers, oral antihistamines, and non-narcotic analgesics, all of which were obtained from other passengers, were used frequently enough to support a suggestion to include them in the medical kit.

Author

*Airline Operations; Air Transportation; In-Flight Monitoring; Crew Procedures (Inflight); Medical Services*

20000052604 NASA Langley Research Center, Hampton, VA USA

**Aerospace Medicine and Biology: A Continuing Bibliography With Indexes, Supplement 500**

May 2000; 48p; In English

Report No.(s): NASA/SP-2000-7011/Suppl500; NAS 1.21:7011/Suppl500; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report lists reports, articles and other documents recently announced in the NASA STI Database.

Derived from text

*Aerospace Medicine; Bibliographies; Data Bases; Indexes (Documentation)*

20000057163 Army Research Inst. of Environmental Medicine, Natick, MA USA

**Effects of a Shoulder Harness on Litter Carriage Performance and Post-Carry Fatigue of Men and Women**

Rice, Valerie J.; Sharp, Marilyn A.; Tharion, William J.; Williamson, Tania; Nov. 1999; 76p; In English

Report No.(s): AD-A373047; USARIEM-T-00-7; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this study was to determine whether an ergonomically designed harness would improve soldier performance during and after litter carrying. Two litter carrying tasks were used: 1) a simulated mass casualty task; carrying and loading as many patients as possible within 15 mins and 2) a simulated removal from a remote site, carrying the litter at a constant rate of 4.8 km/hr for as long as possible, up to 30 min. Each task used a repeated measures design to determine differences in harness use, team size, and gender. Soldiers (12 men and 11 women) were measured on the following measures: rifle marksmanship, a fine motor task, heart rate and oxygen uptake while litter carrying, time of carry, number of carries, and ratings of perceived exertion. During the mass casualty task, men carried and loaded more patients than women (18 vs. 14 carries), and women reported greater soreness/discomfort than men post-carry. Using a harness resulted in faster fine-motor performance (47.6 vs. 46.1 sec) and lower subjective ratings of physical symptoms than with a hand carry.

DTIC

*Aerospace Medicine; Shoulders; Harnesses*

20000057301 NASA Johnson Space Center, Houston, TX USA

**Effect of In-Flight Exercise and Extravehicular Activity on Postflight Stand Tests**

Lee, Stuart M. C., Wyle Labs., Inc., USA; Moore, Alan D., Jr., Wyle Labs., Inc., USA; Fritsch-Yelle, Janice, NASA Johnson Space Center, USA; Greenisen, Michael, NASA Johnson Space Center, USA; Schneider, Suzanne M., NASA Johnson Space Center, USA; Foster, Philip P., Baylor Coll. of Medicine, USA; May 2000; 30p; In English

Contract(s)/Grant(s): NAS9-18492

Report No.(s): NASA/TM-2000-210185; NAS 1.15:210185; S-860; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study was to determine whether exercise performed by Space Shuttle crewmembers during short-duration spaceflights (9-16 days) affects the heart rate (HR) and blood pressure (BP) responses to standing within 2-4 hr of landing. Thirty

crewmembers performed self-selected in-flight exercise and maintained exercise logs to monitor their exercise intensity and duration. A 10min stand test, preceded by at least 6 min of quiet supine rest, was completed 10- 15 d before launch (PRE) and within four hours of landing (POST). Based upon their in-flight exercise records, subjects were grouped as either high (Hlex: = 3x/week, HR = 70% ,HRMax, = 20 min/session, n = 11), medium (MEDex: = 3x/week, HR = 70% HRmax, = 20 min/session, n = 10), or low (LOex: = 3x/week, HR and duration variable, n = 11) exercisers. HR and BP responses to standing were compared between groups (ANOVA, or analysis of variance, P is less than 0.05). There were no PRE differences between the groups in supine or standing HR and BP. Although POST supine HR was similar to PRE, all groups had an increased standing HR compared to PRE. The increase in HR upon standing was significantly greater after flight in the LOex group (36+/-5 bpm) compared to Hlex or MEDex groups (25+/-1bpm; 22+/-2 bpm). Similarly, the decrease in pulse pressure (PP) from supine to standing was unchanged after spaceflight in the MEDex and Hlex groups, but was significantly less in the LOex group (PRE: -9+/- 3, POST: -19+/- 4 mmHg). Thus, moderate to high levels of in-flight exercise attenuated HR and PP responses to standing after spaceflight compared.

Author

*Blood Pressure; Extravehicular Activity; Heart Rate; Physical Exercise; Spacecrews; Gravitational Physiology; Hemodynamic Responses; Blood Circulation; Gravitational Effects*

20000057466 Civil Aeromedical Inst., Oklahoma City, OK USA

**DNA-Based Detection of Ethanol-Producing Microorganisms in Postmortem Blood and Tissues by Polymerase Chain Reaction *Final Report***

Vu, Nicole T., Civil Aeromedical Inst., USA; Chaturvedi, Arvind K., Civil Aeromedical Inst., USA; Canfield, Dennis V., Civil Aeromedical Inst., USA; Soper, John W., Civil Aeromedical Inst., USA; Kupfer, Doris M., Oklahoma Univ., USA; Roe, Bruce A., Oklahoma Univ., USA; May 2000; 14p; In English

Contract(s)/Grant(s): AM-B-97-TOX-202; AM-B98-TOX-202; AM-B-99-TOX-202; AM-B-00-TOX-202

Report No.(s): DOT/FAA/AM-00/16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Forensic investigation of fatal aircraft accidents usually includes the analysis of biological samples for ethanol to establish if alcohol intoxication is a factor in the accidents. The quantitative aspects of ethanol are often complicated by postmortem putrefactive changes, leading to microbial fermentation-mediated production of alcohol and its subsequent redistribution. Without establishing the ethanol origin (antemortem consumption or postmortem production), a precise interpretation of the alcohol analytical results remains a challenge. Therefore, a DNA-based assay was developed using the polymerase chain reaction and microbial DNA primers designed for identifying 3 commonly encountered ethanol-producing microorganism-Candida albicans, Proteus vulgaris, and Escherichia coli. The present study focused on examining the applicability of the microbial DNA primers in establishing the existence of postmortem alcohol in samples. The results suggested that species- specific primers could be employed to identify ethanol-producing microorganisms in forensic samples without requiring bacterial cultivation. Continued studies are warranted to define additional primer sequences that are distinctive for ethanol-producing microorganisms.

Author

*Deoxyribonucleic Acid; Ethyl Alcohol; Sequencing; Fermentation; Microorganisms*

## 53

### BEHAVIORAL SCIENCES

*Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.*

20000053012 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

**Improving Aircrews' Crosscheck of Flight Instruments when Using NVGs. IIFM Workshop on "What is Essential for Virtual Reality to Meet Military Performance Goals"**

Antonio, Joseph; Jan. 2000; 2p; In English

Report No.(s): AD-A375769; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Current ground-based introductory night vision goggle (NVG) training consists of classroom lectures, hands-on adjustment training, terrain board demonstrations, and, for a few platforms, simulator training. The content of the lectures was developed jointly between the USAF and USN and is standardized for all platform types. NVG video sequences of actual events are integrated with the lectures to support verbal descriptions of operationally relevant concerns, such as illusion and misperceptions. Terrain boards are used to demonstrate visual phenomena specific to the NVG image resulting from the intensification process. NVG-capable simulators provide for good "system integration" training (e.g., looking beneath the NVG at cockpit instruments, scanning the outside scene, etc.), but due to inadequacies with the simulated imagery, there are serious limitations to "visual"

training. Consequently, terrain board demonstrations continue to be the best method of demonstrating many of the NVG image characteristics. There is currently no "table-top" computer training available for reinforcing some of the more important NVG lessons learned from operational experience and mishaps.

DTIC

*Virtual Reality; Flight Crews; Flight Instruments; Goggles; Night Vision*

20000053527 Legacy Good Samaritan Hospital, Neurology Research, Portland, OR USA

*Otolith and Vertical Canal Contributions to Dynamic Postural Control Final Report, 1 Sep. 1993 - 31 Aug. 1999*

Black, F. Owen, Legacy Good Samaritan Hospital, USA; [1999]; 16p; In English

Contract(s)/Grant(s): NAG5-6329; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this project is to determine: 1) how do normal subjects adjust postural movements in response to changing or altered otolith input, for example, due to aging? and 2) how do patients adapt postural control after altered unilateral or bilateral vestibular sensory inputs such as ablative inner ear surgery or ototoxicity, respectively? The following hypotheses are under investigation: 1) selective alteration of otolith input or abnormalities of otolith receptor function will result in distinctive spatial, frequency, and temporal patterns of head movements and body postural sway dynamics. 2) subjects with reduced, altered, or absent vertical semicircular canal receptor sensitivity but normal otolith receptor function or vice versa, should show predictable alterations of body and head movement strategies essential for the control of postural sway and movement. The effect of altered postural movement control upon compensation and/or adaptation will be determined. These experiments provide data for the development of computational models of postural control in normals, vestibular deficient subjects and normal humans exposed to unusual force environments, including orbital space flight.

Author

*Otolith Organs; Abnormalities; Dynamic Control; Semicircular Canals; Sensitivity; Vestibules*

20000054667 Institute for Human Factors TNO, Soesterberg, Netherlands

*How to Compose a PsyOps Message: The Effects of Involvement and Information Source on Persuasion Interim Report Hoe Stel je een PsyOps Boodschap Samen: De Effecten van Betrokkenheid en Informatiebron op Overtuiging*

Griffioen-Young, H. J., Institute for Human Factors TNO, Netherlands; Apr. 04, 2000; 23p; In English

Contract(s)/Grant(s): A98/CO/385; TNO Proj. 791.2

Report No.(s): TD-2000-0131; TM-00-A025; Copyright; Avail: Issuing Activity

In the literature on psychological operations (PsyOps) much attention is paid to various methods of influencing people's attitudes and behavior. In both military and civilian bodies of literature, discussions can be found of specific incidences of the use of PsyOps methods to reach goals using means other than traditional armed conflict. However, very little literature is available in which the effectiveness of various PsyOps methods is critically evaluated or in which the theory behind the development of PsyOps methods is discussed. As a result, it would seem that both the development and implementation of PsyOps occur in a rather arbitrary and haphazard fashion based mostly on an unsystematic trial and error attempts. In the present study, a more systematic approach is taken to examine written PsyOps materials, such as pamphlets which may be distributed to an audience. Specifically, the present study investigates the role of the audience's involvement with the topic under consideration and the source from which persuasive information comes. Participants read three arguments supporting a particular standpoint for each of three topics, which varied in audience involvement. Participants then indicated the degree to which they supported each of the topics. Participant's attitudes on the various topics before versus after reading the arguments were assessed. The results show that when involvement is moderate to high, persuasion is primarily determined by perceived argument strength. Alternatively, when involvement is low, argument strength is of little consequence: attitude change appears to be determined by simply reading about a particular viewpoint. The results are discussed in terms of the theoretical and practical implications and practical tips are offered for developing written PsyOps messages.

Author

*Psychology; Human Behavior*

20000054784 Defence Procurement Agency, Eurofighter Requirements, Bristol, UK

*Interactive Hybrid Environment Training*

Sullivan, John M., Defence Procurement Agency, UK; Flight Simulation - The Next Decade: Proceedings; [2000], pp. 3.1 - 3.8; In English; See also 20000054782; Copyright; Avail: Issuing Activity

The UK requirement for Eurofighter Typhoon Aircrew Synthetic Training Aids (ASTA) was determined by 2 Training Needs Analyses (TNAs). Subsequent to the conclusion of these comprehensive studies, the doctrine of the UK Armed Forces was fundamentally reviewed to reflect the emerging perception of the military capability demanded by the change in global politics,



alliances and attitudes that accompanied the end of the Cold War. Accordingly, an appraisal of the previous TNAs was conducted during 1999, to ensure their continued relevance. In attempting to determine the most appropriate medium with which to address the total training task for EF pilots, it became apparent that there were fundamental limitations in the training that can be delivered by both real and synthetic regimes in isolation. However, a capability to merge these training regimes could mitigate these inherent weaknesses and draw upon the strengths of each to create a holistic training environment. This paper represents the personal vision of the author and does not reflect current MOD procurement or training policy. Although the EF programme is used consistently for illustrative purposes, the concept is equally applicable to all modern, high-performance combat aircraft.

Author

*Aircraft Performance; Education; Policies; Tasks; Training Analysis*

20000054787 Virgin Atlantic Airways, Crawley, UK

**Flight Crew Training Needs for the Future**

Pugh, John, Virgin Atlantic Airways, UK; Wood, Simon J., Virgin Atlantic Airways, UK; Flight Simulation - The Next Decade: Proceedings; [2000], pp. 10.1 - 10.6; In English; See also 20000054782; Copyright; Avail: Issuing Activity

The current JAA training regulations present an imbalance of emphasis of training requirements versus modern air transport operations and identified causes of aircraft accidents and incidents. Compared with the 1960's, today's air transport carriers operate in areas of high aircraft density, in worse weather and in higher frequency to areas of inhospitable terrain. Advances in technology have resulted in more reliable aircraft systems that fail, mechanically, less often but these advances have introduced problems in man-machine interface and the management of complex computer controlled systems. Training and checking for events covering mechanical failures are stipulated in detail whereas environmental factors and system management failures are only stipulated within the context of a broad collection of categories from which the operator may choose a minimum number at random. This creates an imbalance in emphasis within the training regulations. The task and operation of modern air transport has grown, training requirements have not grown in pace.

Author

*Regulations; Numerical Control; Man Machine Systems; Flight Training; Failure; Education; Control Systems Design; Complex Systems*

20000054790 Embry-Riddle Aeronautical Univ., Daytona Beach, FL USA

**Aviation Instruction Through Flight Simulation: Enhancing Pilot Decision-Making Skills**

Green, Mavis F., Embry-Riddle Aeronautical Univ., USA; Flight Simulation - The Next Decade: Proceedings; [2000], pp. 13.1 - 13.8; In English; See also 20000054782; Copyright; Avail: Issuing Activity

Information was collected from collegiate aviation programs to answer the research question: What type(s) of learning best explain how learners are socialized to aviation through the use of simulation technology? This is important because the use of appropriate educational strategies in training devices could provide ways to enhance pilot judgement as well as increase technical skills. Data from this study showed confusion and inconsistency on the parts of instructors implementing this instruction. Risk perception is identified as an important element in choosing instructional strategies. Cognitive apprenticeship is explored as an appropriate type of learning in high-risk fields.

Author

*Decision Making; Education; Systems Simulation; Transfer of Training*

20000054791 Thomson Training and Simulation Ltd., Crawley, UK

**The Future and Technology of Remote Training 'Bringing Training to the Pilot'**

White, David, Thomson Training and Simulation Ltd., UK; Flight Simulation - The Next Decade: Proceedings; [2000], pp. 14.1 - 14.8; In English; See also 20000054782; Copyright; Avail: Issuing Activity

The advances in Personal Computer (PC) processing power, graphics and network bandwidth are providing an environment that allows the full range of Full Flight Simulator (FFS) functionality & fidelity to be accessed from a laptop PC. The latest generation of Thomson Training & Simulation (TT&S) Flight Management System Trainers (FMST), Enhanced Situation Awareness Trainers (ESAT) and Cockpit System Trainers (CST) also encompass provision for access via a modem or Internet connection. This enables them to be used as 'remote learning and practice' facilities which do not require the pilot to travel to the 'Airline Training Center'. Since these technologies will no doubt subsequently influence the training methods and type of training equipment delivered in the next decade, this paper discusses the technologies employed, the first feedback from the beta trials and the lessons learned. During late 1999 TT&S and Honeywell Aviation Services set-up a beta site to start testing the principles of remote 'practice'. Initial prototype testing has subsequently confirmed that the PC processing power, graphics and network bandwidth are not a problem. However the issues generated by the variation in network latency 'Jitter' when closing the loop over

a commercial Internet Service Provider (ISP) connection, especially over Trans-Atlantic or Trans-Pacific connections, can be somewhat problematic. The emphasis has been on evaluating the technology for use in remote learning and practice at this juncture, the next stage envisages the training community and regulatory bodies assessing the methodology and fidelity of these devices for inclusion in both established and newly generated approved training programs.

Author

*Training Devices; Prototypes; Management Systems; Flight Management Systems*

20000054806 Thomson Training and Simulation Ltd., Crawley, UK

**Collective Training: Virtually a Reality or Still Over the Horizon?**

Aylward, Mark, Thomson Training and Simulation Ltd., UK; Flight Simulation - The Next Decade: Proceedings; [2000], pp. 31.1 - 31.9; In English; See also 20000054782; Copyright; Avail: Issuing Activity

Collective training has been talked about as the future direction of military synthetic training for the past few years. Most UK flight simulation programmes contracted in the last five years have had some form of networking requirement included. Industry has invested in and delivered real time networking technologies. In the ground training environment CATT continues development. In the US the No-Can-Pay milestone for HLA compliance passed at the start of 1999. The No-Can-Play milestone will be passed in 2001. But are we really any closer to realising the 'train-as-we-fight' ethic in the UK air domain? What exactly do collective training and DIS or HLA compliance mean? Can this capability really be retrofitted to existing systems? Are we prepared for the implications of delivering collective training? How does collective training fit in with the supply of training services via the Public-Private-Partnership? Should we invest in technical developments to support a capability, which may rarely (or never) be used in anger? Just what will it take to make air domain collective training in the UK a reality? This paper will examine the issues raised above, attempt to answer some of the questions and propose some alternatives, which may come to fruition in the next decade.

Author

*Real Time Operation; Flight Simulation; Networks; Teams; Training Analysis*

20000054873 Institute for Human Factors TNO, Soesterberg, Netherlands

**Development and Needs Statement for Advanced Training Systems** *Interim Report Stappenplan voor de Behoeftestelling*

Verstegen, D. M. L., Institute for Human Factors TNO, Netherlands; Barnard, Y. F., Institute for Human Factors TNO, Netherlands; vanderHulst, A. H., Institute for Human Factors TNO, Netherlands; Sabel, A. A., Institute for Human Factors TNO, Netherlands; Mar. 16, 2000; 50p; In Dutch

Contract(s)/Grant(s): A99/KL/326; TNO Proj. 790.1

Report No.(s): TD-2000-0126; TM-00-A020; Copyright; Avail: Issuing Activity

This report describes the work of workpackage 3 of the project "GOLM-ontwikkeling", a project about the development of a needs statement for advanced training systems for the Dutch Army. Based on the analysis of available (theoretical and empirical) knowledge and discussions with domain experts a methodology has been developed. This methodology will lead users step by step through the process of developing a needs statement, based on global specifications and requirements and a first estimation of the required (financial and other) means. The methodology offers a structured and standardized way to develop such a needs statement. This does not mean the development process will always be the same: based on, for example the complexity of the domain and the amount of information available, steps will take more or less time, some steps will sometimes get less emphasis or will be only partly executed.

Author

*Education; Training Simulators; Military Operations*

20000057291 York Univ., Ontario Canada

**Visual and Auditory Sensitivities and Discriminations** *Final Report, 15 Dec. 1996 - 14 Dec. 1999*

Regan, David; Feb. 2000; 106p; In English

Contract(s)/Grant(s): F49620-97-1-0051

Report No.(s): AD-A376091; AFRL-SR-BL-TR-00-0124; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Errors in judging absolute time to collision using monocular information alone range from 2 to 12% and from 2.5 to 10% using binocular information alone, but only 1.3 to 2.7% using the combination. For small targets, judgements are based entirely on binocular information. Individuals make large errors in judging absolute time to collision with a rotating nonspherical object when judgements are based on monocular information, but not when binocular information is provided. When simulating closure with a textured object, systematic errors in judging time to collision can occur if the rates of expansion of texture element size and object size are not matched exactly. Exposure to expanding images produces errors in judging time to collision that may cause

errors in NOE flight and may be a cause of rear-end highway collisions. The human visual system does contain binocular mechanisms sensitive to speed. Simulated objects can be seen and recognized entirely on the basis of texture differences. The physiological limit for locating a texture-defined boundary is 1.7 to 2.4 min arc, and visual acuity for texture-defined gratings is above 7 c/deg. Spatial frequency discrimination threshold is approx. 5% for both texture-defined and luminance-defined gratings for frequencies less than 3 - 4 c/deg.

DTIC

*Visual Acuity; Visual Perception; Auditory Perception; Sensitivity; Discrimination; Flight Simulators; Collision Avoidance*

20000057496 Institute for Human Factors TNO, Soesterberg, Netherlands

**Toward Tailored Team Training: The Effect of Interaction-Specific and Interaction-Generic Cross-Training Instruction on the Performance of Teams Working With an Open or Fixed Team Task Structure** *Final Report*

Bots, M. J., Institute for Human Factors TNO, Netherlands; Schaafstal, A. M., Institute for Human Factors TNO, Netherlands; Riemersma, J. B. J., Institute for Human Factors TNO, Netherlands; Mar. 11, 2000; 58p; In English

Contract(s)/Grant(s): B00-052; TNO Proj. 790.2

Report No.(s): TD-2000-0134; TM-00-8005; Copyright; Avail: Issuing Activity

Despite the often implicit acknowledgement that team training programs should take differences between teams into account, relatively few studies have systematically investigated what kind of team training method is optimal, given certain team and task characteristics. In order to gain more knowledge about how team training should be designed to fit specific characteristics of the team task, an experiment was carried out in which the effect of two cross-training instructions was examined on the performance of teams working with an open and fixed task structure. Teams working with an open task structure can be characterized by a high degree of overlap between the tasks and responsibilities of individual team members. Working with an open task structure requires from team members to allocate tasks, choose their own team strategy and organize their working interactions with a minimum of prescribed procedures. Teams working with a fixed task structure can be characterized by clear task distinctions between specialized team members. Working with a fixed task structure requires from team members to follow a predetermined team strategy and to interact with each other according to prescribed rules, procedures and routines. Based on acquired knowledge of the learning of teams, the expectation was that an interaction-generic cross-training instruction, consisting of general rules and guidelines, would be more appropriate for teams working with an open task structure. Expected was that an interaction-specific cross-training instruction, consisting of specific rules and procedures, would be the best training method for teams with a fixed task structure. The results of the present study show that an interaction-generic cross-training instruction is the best training method for teams working with an open task structure. When compared with teams receiving no explicit cross-training, the results also indicate that teams characterized by an open task structure benefit more from a tailored cross-training instruction (which in their case is interaction-generic) than teams characterized by a fixed task structure. Furthermore the present study demonstrates that the opportunity to practice in a certain task structure influences the effect of the cross-training instruction on certain aspects of team performance, such as the ability of teams to adapt to changes in task structure and the amount of errors made. The results of this study will be discussed in terms of their relevance to the design of effective training interventions taking relevant team task characteristics into account.

Author

*Education; Teams; Human Performance*

20000057497 Institute for Human Factors TNO, Soesterberg, Netherlands

**Team Effectivity in Future Maritime Command** *Interim Report Teamfunctioneren in Toekomstige Maritieme Commandovoering*

Essens, P. J. M. D., Institute for Human Factors TNO, Netherlands; Rasker, P. C., Institute for Human Factors TNO, Netherlands; Post, W. M., Institute for Human Factors TNO, Netherlands; Hoeksema-vanOrden, C. Y. D., Institute for Human Factors TNO, Netherlands; Mar. 08, 2000; 50p; In Dutch

Contract(s)/Grant(s): A98/KM/342; TNO Proj. 791.1

Report No.(s): TD-00-0120; TM-00-A014; Copyright; Avail: Issuing Activity

Under contract of the Royal Netherlands Navy research is being done concerning the organisation and support of future command on board. An overview of critical factors for team effectiveness is given based on an assessment of the current M-frigates and literature data. The result can be organised under three main factors: task organisation, information exchange by communication, and psycho-social aspects of cooperation. It was concluded that in order to be able to respond and anticipate to dynamically complex situations an adaptive distribution of tasks is required in which team members can take over each others tasks (team adaptation). In a first analysis of a hypothetical organisational model with operational experts based on information processing-based task clusters it was concluded that such a clustering provides the opportunity for team adaptation. The subteams

should be small with multi-functionally trained team members. The role of a process supervisor in the subteams may become crucial for direction and communications between the teams. The consequences of new forms of work organisation will be analysed and quantified in subsequent studies. Besides the analysis of operational consequences, the required personnel qualifications and training requirements will be assessed. For the study of the operational effects a modelling environment will be developed. The basis for such a model is described here.

Author

*Teams; Personnel Development; Education; Data Processing*

20000057510 Institute for Human Factors TNO, Soesterberg, Netherlands

**Points of Departure for Future Maritime Command and Control: Human and Organizational Factors** *Interim Report*  
*Uitgangspunten voor een Toekomstige Maritieme Commandovoering: Mens- en Organisatiefactoren*

Essens, P. J. M. D., Institute for Human Factors TNO, Netherlands; vanDelft, J. H., Institute for Human Factors TNO, Netherlands; Mar. 06, 2000; 16p; In Dutch

Contract(s)/Grant(s): A98/KM/342; TNO Proj. 791.1

Report No.(s): TD-00-0119; TM-00-A013; Copyright; Avail: Issuing Activity

For the Royal Netherlands Navy a research program is initiated - the Command Study - to develop and analyse new concepts of command and control on board of a naval platform with a view to future operational and task requirements and reduced manning. As a first approach a vision was developed and related critical issues were identified. The vision is that new ways of command can be realised by reduction of vertical command and control levels and by integration of operational tasks. Its feasibility depends on the realization of a number of critical requirements, such as situational data integration, tactical treat analysis, quickening anticipation and reaction times, whether people are able to perform different warfare tasks in parallel, whether work load peaks can be dynamically distributed in the organization, and complex skills can be acquired and maintained efficiently.

Author

*Command and Control; Human Factors Engineering; Navy*

20000057514 Oklahoma Univ., Norman, OK USA

**Guidelines for Bootstrapping Validity Coefficients in ATCS Selection Research** *Final Report*

Russell, Craig J., Oklahoma Univ., USA; Dean, Michelle, Oklahoma Univ., USA; Broach, Dana, Civil Aeromedical Inst., USA; May 2000; 50p; In English

Contract(s)/Grant(s): AM-97-B-HRR-509

Report No.(s): DOT/FAA/AM-00/15; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This technical report are: 1) reviews the literature on bootstrapping estimation procedures and potential applications to the selection of air traffic control specialists (ATCSs), 2) describes an empirical demonstration of procedures for estimating the sample size required to demonstrate criterion-related validity in ATCS selection, and 3) provides summary guidelines and recommendations for estimating sample size requirements in ATCS selection test validation using bootstrapping procedures under conditions of direct and indirect range restriction. Bootstrapping estimates the sampling distribution of a statistic by iteratively resampling cases from a set of observed data. Confidence intervals are constructed for the statistic, providing an empirical basis for inferential statements about the likely magnitude of the statistic. Correlations between scores on the written ATCS aptitude test battery and subsequent performance in initial qualification training for a large sample of 10,869 controllers hired between 1986 and 1992 were bootstrapped in an empirical demonstration of the methodology. Finally, a three-step sequence of procedures is described for use in future bootstrap estimates of confidence intervals. Recommendations for sample size requirements in future ATC criterion validity studies include: 1. Results suggest samples of at least  $N = 175$  to ensure the 90% confidence interval for  $r(\text{sub } xy)$  does not contain 0. 2. Assumptions of bivariate normality in traditional parametric estimation procedures are not justified in the current data. Note that this observation may result in confidence intervals that are wider or narrower for any given sample size than intervals obtained from traditional parametric estimation. 3. Corrections for direct range restriction did not substantively influence whether the bootstrapped 90% confidence interval contained 0. Future applications should assess whether this holds true. 4. Given the apparent absence of bivariate normality in the current data, similar bootstrapping procedures should be used to assess whether the 90% confidence intervals for  $\rho - \rho(\text{sub } 0)$  and  $R(\text{sub } Y.X1X2) - R(\text{sub } Y.X1)$  contain 0. Overall, the results suggest that bootstrapping of validity coefficients in controller selection research may be technically feasible. However, legal considerations may limit practical use of the methodology until accepted professional guidelines, standards, and principles are revised to accommodate innovative methodologies.

Author

*Estimating; Procedures; Qualifications; Psychological Tests; Criteria*

*Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..*

20000046610 Ljubljana Univ., Fakulteta za Elektrotehniko, Ljubljana, Slovenia

**Time Optimal Control of Batch Phases in Biological Wastewater Treatment** *Casovno Optimalno Vodenje Zaključevanja faz Biotehnoškega Sarznega Procesu*

Pavselj, Natasa, Ljubljana Univ., Slovenia; Hvala, Nadja, Jozef Stefan Inst., Slovenia; Kocijan, Jus, Ljubljana Univ., Slovenia; Ros, Milenko, Kemijski Institut, Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 1, pp. 9-15; In Slovak; Copyright; Avail: Issuing Activity

This paper is concerned with control of a sequencing batch reactor (SBR) for wastewater treatment. Compared to continuous processes, this batch reactor is characterised by a more stable process operation, but requires a higher level of process control and automation. An important problem in the operation of SBR is on-line control of batch phases duration. This control function should be applied due to the variable input load which requires an adjustment of phase duration for each batch. In this way, each phase is terminated when corresponding biological reactions are completed. It is expected that such a control strategy improves the quality of the treated water and minimises the energy consumption due to the shortening of the aerobic phase. An obstacle for the application of this control function is the lack of on-line data for following the course of biodegradation processes during the batch. Measurements of wastewater components that are crucial for termination of batch phases are usually performed only by laboratory analyses as sensors in this area are often very expensive or not available at all. Sometimes they are not very reliable or have a too great I and are thus not appropriate for on-line control. To overcome this problem, the control strategy in this paper is based on some simple indirect process measurements that could be related to the course of biodegradation processes. Namely, laboratory experiments have shown that on-line measurements of the dissolved oxygen concentration, redox potential and pH contain some characteristic patterns that indicate the end of biodegradation processes. In particular, the dissolved oxygen breakpoint could be used to define the termination time of the aerobic phase, while nitrate knee is used to detect the end algorithm is based on heuristic rules that act on the derivative of filtered signals. The proposed control procedure was tested on a laboratory pilot plant supported by an experimental computer supported environment. The environment is designed in such a way that the control algorithms designed in the MATLAB package could be immediately applied and tested on the pilot plant. On-line testing of the proposed procedure, supported by laboratory measurements, showed a good agreement of the computed times for the termination of batch phases with those corresponding to the actual termination of biodegradation processes.

Author

*Time Optimal Control; Waste Water; Water Treatment; Sequencing; Biodegradation; Algorithms*

20000048257 NASA Johnson Space Center, Houston, TX USA

**Skin Temperatures During Unaided Egress: Unsuiting and While Wearing the NASA Launch and Entry or Advanced Crew Escape Suits**

Woodruff, Kristin K., Wyle Labs., Inc., USA; Lee, Stuart M. C., Wyle Labs., Inc., USA; Greenisen, Michael C., NASA Johnson Space Center, USA; Schneider, Suzanne M., NASA Johnson Space Center, USA; March 2000; 44p; In English  
Report No.(s): NASA/TM-2000-209761; NAS 1.15:209761; S-853; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The two flight suits currently worn by crew members during Shuttle launch and landing, the Launch and Entry Suit (LES) and the Advanced Crew Escape Suit (ACES), are designed to protect crew members in the case of emergency. Although the Liquid Cooling Garment (LCG) worn under the flight suits was designed to counteract the heat storage of the suits, the suits may increase thermal stress and limit the astronaut's egress capabilities. The purpose of this study was to assess the thermal loads experienced by crew members during a simulated emergency egress before and after spaceflight. Comparisons of skin temperatures were made between the preflight unsuited and suited conditions, between the pre- and postflight suited conditions, and between the two flight suits.

Author

*Egress; Garments; Heat Storage; Liquid Cooling; Thermal Stresses; Performance Tests*

20000048388 Maryland Univ., College Park, MD USA

**Design of a Power-Assisted Spacesuit Glove Actuator**

Howard, Russell D., Maryland Univ., USA; 34th Aerospace Mechanisms Symposium; May 2000, pp. 89-102; In English; See also 20000048380; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper presents the details of the design and implementation of an electromechanical power-assisted spacesuit glove actuator. The project was a joint effort by the University of Maryland's Space Systems Laboratory and ILC Dover, Inc., and involved innovative approaches to power augmentation and compact actuator packaging. The first actuator built validated several basic design concepts, and the second demonstrated improved performance and met many of the goals for flight qualification of the technology.

Author

*Design Analysis; Electromechanical Devices; Space Suits; Gloves; Actuators*

20000048615 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

**Development of the U.S. Navy Advanced Personal Air Conditioning System (APACS)**

Kaufman, Jonathan; Jan. 1999; 6p; In English

Report No.(s): AD-A375855; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes the technology behind the development of the USN APACS man-mounted cooling system, a key component of HAILSS. APACS represents a lightweight, man-mounted cooling system for aircrews requiring no airframe modifications. This system is suitable for all crew stations and can be used during preflight inspections or by nonflying personnel.

DTIC

*Cooling; Air Conditioning Equipment; Protective Clothing; Technology Assessment*

20000048822 Aeronautical Systems Div., Directorate of Flight Systems Engineering, Wright-Patterson AFB, OH USA

**B-1B Human Factors Baseline Study Report Final Report, 1 Mar. - 31 Oct. 1999**

Kalman, William G.; Kline, Jane M.; Provost, Scott; Gable, Beverly A.; Taylor, Christopher R.; Nov. 1999; 101p; In English

Report No.(s): AD-A375841; ASC-TR-1999-5007; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

A Human Factors study was conducted on B-1B Blocks D, E, and F. The 1st study objective was to evaluate B-1B Blocks D, E, and F crew workload and situational awareness. The 2nd objective was to establish a measurable crew performance baseline for future B-1B Block upgrades. These objectives were studied in the B-1B Engineering Research Simulator (ERS) in a simulated full mission environment using eight B-1B crews. After training, the crews flew two missions. Workload and situational awareness were measured, a questionnaire was given, and all missions were video taped. Human Factors improvements were recommended.

DTIC

*Human Factors Engineering; Human Performance*

20000052258 Naval Aerospace Medical Research Lab., Pensacola, FL USA

**Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) Summary**

Bransdorfer, A. H.; Johnson, K. R.; Dec. 22, 1999; 22p; In English

Contract(s)/Grant(s): Proj-

Report No.(s): AD-A375339; NAMRL-TM-99-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aviation life support systems (ALSS) equipment is a critical and essential component for mission success in naval aviation. Anecdotal comments by naval aircrews have indicated that ALSS equipment is perceived as ill-fitting and substandard. Additionally, many aircrews in naval aviation are not satisfied with current urine collection devices (UCDs). The Aircrew Modified Equipment Leading to Increased Accommodation (AMELIA) survey was completed by 2,055 U.S. Navy and Marine Corps aircrew. The sample population included 85 women and 1,970 men. According to the survey results, ALSS equipment appears to fit slightly better than "ok" in all but the anti-exposure suit. The overall performance of current ALSS was rated slightly above the median with the exception of the anti-exposure suit (rated below the median). Aircrews identified the flight suit as the number-one priority with respect to safety, thermal protection, and comfort. The helmet was identified as the number one priority item with respect to survivability. The majority of the sampled aircrew has required the use of urine collection devices (UCDs) during flight. These aircrews selected the piddle pack and relief tube as moderately acceptable solutions for urination during flight.

DTIC

*Flight Crews; Human Beings; Medical Equipment; Urine*

20000053024 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

**Current USN/USMC Aircraft Anthropometric Compatibility Issues and the "Street to Fleet" Proposal**

Tucker, Heather D.; Brattin, Lori L.; Jan. 2000; 7p; In English

Report No.(s): AD-A375810; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Shortcomings of the USN/USMC anthropometric compatibility process have driven a requirement for an improved process, "Street to Fleet". During the course of the NAVAIRSYSCOM (PMA-202) Aircrew Accommodation Expansion Program

(reference I), where AIR 4.6, Patuxent River was tasked to perform accommodation evaluations on in-service USN/USMC inventory, the increased costs associated with safely assigning aviators to an appropriate training curriculum through to their fleet aircraft have been identified. Both the shortcomings and increased costs are due in part to the lack of solid legacy guidance. Currently, four anthropometric measurements receive a "code" that indicates whether a particular candidate is compatible, incompatible, or requires a "fit check". Under current official guidance, a short sitting height is the only anthropometric measurement that receives an incompatible Anthropometric Restriction Code (ARC) with a given aircraft, primarily due to inadequate over the nose visibility. Newer aircraft are designed with the intent of accommodating an increased proportion of anthropometric extremes and these anthropometric parameters are considered simultaneously vice one dimension at a time. Therefore, the process used to screen aviators needs to more closely relate to the specification guidance used to develop the aircraft.

DTIC

*Man Machine Systems; Anthropometry; Aircraft Pilots; Compatibility*

20000053028 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

**Helicopter Aircrew Integrated Life Support System (HAILSS)**

Dolinar, Paul; Jan. 2000; 4p; In English

Report No.(s): AD-A375818; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Helicopter Aircrew Integrated Life Support System (HAILSS) Program is a U.S. Navy led effort that began in April 1997 at the Naval Air Warfare Center Aircraft Division (NAWCAD) Patuxent River, MD. The main contractor is Gentex Corporation, Carbondale, PA. The HAILSS ensemble provides CB, anti-exposure and fire protection in single 2-layered impermeable garment, greatly reducing the layers of clothing currently required. Since no comparable system currently exists, it is difficult to compare protection ensembles. However, if you compare the Worst case scenario, up to seven layers of clothing would be required to provide the same level of protection HAILSS offers in just two layers. A more probable comparison of likely worn layers would show a nearly 20% reduction in weight of the HAILSS ensemble versus currently worn systems.

DTIC

*Life Support Systems; Flight Crews; Protective Clothing; Protection*

20000053091 Wilmer Ophthalmological Inst., Wilmer Ophthalmological Inst., Baltimore, MD USA

**Visual Motion Perception Final Report, 15 Mar. 1997-14 Dec. 1998**

Turano, Kathleen A.; Mar. 06, 2000; 85p; In English

Contract(s)/Grant(s): F49620-97-1-0028

Report No.(s): AD-A375117; 52-0595110; AFRL-SR-BL-TR-00-0075; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In operations of aircraft control or target acquisition, the misperception of motion could produce serious errors in a pilot's performance. Little is known about the human observer's ability to accurately judge the velocity of motion while navigating through an environment containing moving objects or while making eye movements. If we can understand how the perception of motion is affected by the presence of moving objects in the environment or by eye movements, we can then specify viewing requirements based on the perceptual cost/benefits. In this project, the human observer's ability to judge velocity was investigated in two sets of experiments. In the first set of experiments the ability to judge self motion in an environment containing moving objects was investigated using simulated optic flow displays. The effects of object and observer velocity on the ability to discriminate between curvilinear and rectilinear self motion were determined. In the second set of experiments, the ability to judge object velocity while making smooth pursuit eye movements was investigated. The effects of stimulus velocity, size, and eccentricity on velocity perception were determined. The findings from the eye movement experiments led to the development of a model that explains how eye velocity signals combine with visual motion signals to determine the perception of motion.

DTIC

*Visual Perception; Motion Perception; Perceptual Errors; Display Devices; Visual Stimuli; Target Acquisition; Aircraft Control*

20000053487 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

**The Transition from Spacecraft Development to Flight Operation: Human Factor Considerations**

Basilio, Ralph R., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 7p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the field of aeronautics and astronautics, a paradigm shift has been witnessed by those in academia, research and development, and private industry. Long development life cycles and the budgets to support such programs and projects has given way to aggressive task schedules and leaner resources to draw from all the while challenging assigned individuals to create and

produce improved products of processes. however, this "faster, better, cheaper" concept cannot merely be applied to the design, development, and test of complex systems such as earth-orbiting of interplanetary robotic spacecraft. Full advantage is not possible without due consideration and application to mission operations planning and flight operations. Equally as important as the flight system, the mission operations system consisting of qualified personnel, ground hardware and software tools, and verified and validated operational processes, should also be regarded as a complex system requiring personnel to draw upon formal education, training, related experiences, and heuristic reasoning in engineering an effective and efficient system. Unquestionably, qualified personnel are the most important elements of a mission operations system. This paper examines the experiences of the Deep Space I Project, the first in a series of new technology in-flight validation missions sponsored by the USA National Aeronautics and Space Administration (NASA), specifically, in developing a subsystems analysis and technology validation team comprised of former spacecraft development personnel. Human factor considerations are investigated from initial concept/vision formulation; through operational process development; personnel test and training; to initial uplink product development and test support. Emphasis has been placed on challenges and applied or recommended solutions, so as to provide opportunities for future programs and projects to address and disposition potential issues and concerns as early as possible to reap the benefits associated with learning from other's past experiences.

Author

*Complex Systems; Computer Programs; Education; Flight Operations; Life (Durability); Mission Planning; Personnel Development; Product Development; Spacecraft Design*

20000054666 Institute for Nutrition and Food Research TNO, Zeist, Netherlands

*Renovation of Military Rations, Part 1, Stability of Canned Meal Interim Report Vernieuwing Rantsoenen, Deel 1, Stabiliteit van Maaltijdsalade in Bussen*

vanBoxtel, L. B. J., Institute for Nutrition and Food Research TNO, Netherlands; April 2000; 28p; In Dutch

Contract(s)/Grant(s): A00/KL/103; TNO Proj. 50800.01.02

Report No.(s): TD-2000-283; TNO-Voeding-V-2700; Copyright; Avail: Issuing Activity

Changing operational tasks and new activity areas of the Dutch armed forces puts new requirements on the meal rations used during exercises and peace keeping activities. In that context ideas for new field rations, like dedicated arctic and hot climate field rations, and renovations for existing rations were (and still are) under study last five years. For use in rations under 'mild hot' to 'hot conditions' two types of canned meal salads were tested for its fitness for use and stability during storage (Mexican salad and Florentine salad). Composition is more or less in accordance with the nutritional requirements of military rations in hot climates. The stability of the products were tested in an orientating accelerated shelf-life test (storage during 4 months at temperature in the range between 0 and 55 C. The microbiological stability is in order, even under hot conditions ('tropical sterility'). The chemical and/or organoleptical stability is of some concern. At 55 C the eating quality drops rapidly. Storage at that temperature for than 2 months makes the product unfit for consumption. At moderated temperatures (20 C) a shelf-life of about 1 year is predicted.

Author

*Armed Forces (Foreign); Rations*

20000054874 Institute for Human Factors TNO, Soesterberg, Netherlands

*Interior Dimensions of Military Services Cars Final Report Interieurafmetingen Civiele Dienstauto's*

Oudenhuijzen, A. J. K., Institute for Human Factors TNO, Netherlands; Mar. 20, 2000; 30p; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): A99/CO/309; TNO Proj. 789.1

Report No.(s): TD-2000-0127; TM-00-A021; Copyright; Avail: Issuing Activity

The vehicles interior dimensions largely determine the possibilities for accommodation of its occupants. Often currently commercially available vehicles are too small for tall Dutch males. Employers encounter problems complying with the Dutch legislation. The Dutch law states that workspaces, and thus vehicles, must accommodate its occupants in an ergonomic acceptable manner. Therefore, the Dutch Army contracted TNO Human Factors Research Institute to determine ergonomic criteria for vehicle interiors (Ellens 1993) to support the vehicle selection process. Today, these criteria need to be updated for several reasons: There are new data available of the Dutch population: the currently used data are outdated caused by the continuing secular trend of acceleration; New, more efficient and more accurate measuring techniques are available for determination of vehicle dimensions. Three activities were carried out: 1. The amount of sink of occupants in car seats was investigated with subjects. The sink increases the available sitting height in cars; 2. The currently used criteria were updated based on available data on Dutch



anthropometry and based on the ongoing secular trend of acceleration; 3. New methods, using digital human modelling techniques, were determined for anthropometric assessments of vehicles.

Author

*Human Factors Engineering; Anthropometry; Human Body*

**20000057022** Department of the Navy, Washington, DC USA

**Breathing Apparatus Having Electrical Power Supply Arrangement With Turbine-Generator Assembly**

Rudolph, Joseph, Inventor; Hughes, Robert, Inventor; Price, Kenneth, Inventor; Oct. 19, 1999; 6p; In English; Supersedes US-Patent-Appl-SN

Patent Info.: Filed 15 Aug. 1997; US-Patent-Appl-SN-08,919,178; US-Patent-5,969,429

Report No.(s): AD-D019697; No Copyright; Avail: US Patent and Trademark Office, Microfiche

An electrical power supply arrangement incorporates a turbine-generator assembly providing a self-contained non-battery electrical power source for supplying power to a breathing apparatus. The turbine-generator assembly is interposed in an air hose extending between first and second stage pressure regulators respectively connected to a pressurized air cylinder and to a cooling device of the breathing apparatus. The assembly includes an air turbine and an electrical generator disposed and coupled in tandem relationship to one another and enclosed in an elongated hollow housing. Pressurized air introduced into the turbine end of the housing expands across turbine blades and rotatably drives a central shaft of the turbine which, in turn, rotates a central rotor of the generator causing generation of electrical power in a stationary stator of the generator which surrounds the rotor. The electrical power can be accessed at a terminal block attached to the generator end of the housing for supplying power to operate the cooling device of the breathing apparatus.

DTIC

*Breathing Apparatus; Turbine Blades; Electric Power Supplies; Electric Generators*

**20000057280** Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

**Towards Development of Robotic Aid for Rehabilitation of Locomotion-Impaired Subjects**

Bejczy, Antal K., Jet Propulsion Lab., California Inst. of Tech., USA; [2000]; 8p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Manual assistance of therapists to help movement of legs of spinal cord injured (SCI) subjects during stepping on a treadmill for locomotion rehabilitation has severe economic and technical limitations. Scientists at the Department of Physiological Science at the University of California Los Angeles (UCLA) and roboticists at the Jet Propulsion Laboratory (JPL) initiated a joint effort to develop a robotic mechanism capable of performing controlled motions equivalent to the arm and hand motions of therapists assisting the stepping of locomotion impaired subjects on a treadmill, while the subjects' body weight is partially supported by an overhead harness. A first necessary technical step towards this development is to measure and understand the kinematics and dynamics of the therapists' arm and hand motions as they are reflected on the subjects' leg movement. This paper describes an initial measurement system developed for this purpose together with the related measurement results, and outlines the planned future technical work.

Author

*Robotics; Robot Control; Robot Dynamics; Locomotion*

**20000057394** Southampton Univ., Human Sciences Group, UK

**Evaluating the Dynamic Performance of Seats Without Using Human Subjects**

Wei, L., Southampton Univ., UK; Lewis, C. H., Southampton Univ., UK; Griffin, M. J., Southampton Univ., UK; April 2000; 106p; In English

Report No.(s): ISVR-TR-286; Copyright; Avail: Issuing Activity

The transmission of vertical vibration through a seat is dependent on the mechanical impedance of the human body supported on the seat: the seat and the body act as a coupled dynamic system. Current procedures for quantifying seat transmissibility and seat vibration isolation efficiency (e.g. SEAT values) therefore employ human subjects in vehicles or on laboratory simulators. The use of human subjects is costly and time-consuming and can involve a range of safety and ethical problems. The research described in this report was conducted to develop test procedures for evaluating the vibration isolation efficiency of seats without using human subjects. Two alternative methods of determining seat performance without human subjects have been developed: (i) the mathematical prediction of seat transmissibility from the separately measured dynamic characteristics of seats and the human body, and (ii) the use of mechanical dummies having dynamic characteristics representing those of the human body. The mathematical prediction method investigated the use of a single degree-of-freedom model and a two degree-of-freedom model of the human body. It was found that while both provided good predictions of measurements of seat transmissibility without a

backrest, the two degree-of-freedom model had the advantage of predicting the second resonance often seen in measurements around 8 Hz. It was found that modifications to these models, to allow for variations in vibration magnitudes and backrest contact, could give improved predictions of seat transmissibility for practical situations. The encouraging results suggest that the method will be useful for the prediction of seat dynamic performance. The currently proposed method of prediction is defined in an appendix. The applicability of a mechanical dummy has been investigated using two forms of mechanical dummy. One type of dummy employed passive elements to represent the mass, damping and stiffness of the human body. It is shown that mechanical dummies tend to suffer from non-linear responses that differ from the non-linear response of the human body and that careful testing of a dummy is required to ensure that the response is appropriate. A prototype single-degree-of-freedom dummy has been developed with an appropriate response at frequencies up to about 20Hz. Tests in the laboratory and in cars shows that this single-degree-of freedom dummy is sufficient to provide useful measures of seat transmissibility. However, optimization of the interaction of such a dummy with the backrest of a seat requires further investigation. The second type of mechanical dummy employed an active actuator to provide the damping and some of the stiffness of the dummy. It is shown that the apparent mass of an appropriate single degree-of-freedom system could be reproduced and controlled at frequencies up to 20Hz. This active dummy has various potential advantages, including the adjustment of characteristics by computer control and minimization of difficulties associated with the non-linearity of a passive dummy and the different non-linearity of the human body.

Author

*Performance Prediction; Prediction Analysis Techniques; Seats; Stiffness; Vibration Isolators; Safety Factors; Human Beings; Human Body; Human Factors Engineering*

# Subject Term Index

## A

ABNORMALITIES, 8  
ACTUATORS, 14  
AEROSPACE MEDICINE, 4, 6  
AIR CONDITIONING EQUIPMENT, 14  
AIR TRANSPORTATION, 6  
AIRCRAFT CONTROL, 15  
AIRCRAFT PERFORMANCE, 9  
AIRCRAFT PILOTS, 15  
AIRLINE OPERATIONS, 6  
ALGORITHMS, 13  
ANIMALS, 2  
ANTHROPOMETRY, 15, 17  
ANTIBODIES, 1  
ANTIGENS, 1  
ARMED FORCES (FOREIGN), 16  
ARTERIOSCLEROSIS, 4  
AUDITORY PERCEPTION, 11

## B

BACTERIA, 1, 3  
BIBLIOGRAPHIES, 6  
BIODEGRADATION, 13  
BIOLOGICAL DIVERSITY, 2  
BIOLOGICAL EFFECTS, 2  
BLOOD CIRCULATION, 7  
BLOOD COAGULATION, 5  
BLOOD PRESSURE, 7  
BOTANY, 3  
BREATHING APPARATUS, 17

## C

CANNULAE, 4  
CARDIOVASCULAR SYSTEM, 4  
CELLS (BIOLOGY), 2, 3  
CHEMICAL ANALYSIS, 3  
CHEMICAL REACTIONS, 5  
CLAMPS, 4  
CLINICAL MEDICINE, 4  
COLLISION AVOIDANCE, 11  
COMMAND AND CONTROL, 12  
COMPATIBILITY, 15  
COMPLEX SYSTEMS, 9, 16  
COMPUTATION, 3  
COMPUTER PROGRAMS, 16  
COMPUTERIZED SIMULATION, 4  
CONTROL SYSTEMS DESIGN, 9

COOLING, 14  
COUPLES, 4  
CREW PROCEDURES (INFLIGHT), 6  
CRITERIA, 12

## D

DATA BASES, 6  
DATA PROCESSING, 12  
DECISION MAKING, 9  
DEOXYRIBONUCLEIC ACID, 2, 7  
DESIGN ANALYSIS, 14  
DESORPTION, 3  
DISCRIMINATION, 11  
DISPLAY DEVICES, 15  
DROSOPHILA, 3  
DYNAMIC CONTROL, 8

## E

EDUCATION, 9, 10, 11, 12, 16  
EGRESS, 13  
ELECTRIC GENERATORS, 17  
ELECTRIC POWER SUPPLIES, 17  
ELECTROMECHANICAL DEVICES, 14  
ENDOTHELIUM, 4  
ENERGY TRANSFER, 4  
ESTIMATING, 12  
ETHYL ALCOHOL, 7  
EXPOSURE, 5  
EXTRAVEHICULAR ACTIVITY, 7

## F

FAILURE, 9  
FERMENTATION, 7  
FLIGHT CREWS, 8, 14, 15  
FLIGHT INSTRUMENTS, 8  
FLIGHT MANAGEMENT SYSTEMS, 10  
FLIGHT OPERATIONS, 16  
FLIGHT SIMULATION, 10  
FLIGHT SIMULATORS, 11  
FLIGHT TRAINING, 9

## G

GARMENTS, 13  
GENE EXPRESSION, 2, 3

GENES, 2, 3  
GENETIC CODE, 2  
GENETIC ENGINEERING, 5  
GENETICS, 2  
GLOVES, 14  
GOGGLES, 8  
GRAVITATIONAL EFFECTS, 7  
GRAVITATIONAL PHYSIOLOGY, 7

## H

HARNESSES, 6  
HEART, 4  
HEART RATE, 7  
HEAT STORAGE, 13  
HEATING, 4  
HEMODYNAMIC RESPONSES, 7  
HUMAN BEHAVIOR, 8  
HUMAN BEINGS, 14, 18  
HUMAN BODY, 17, 18  
HUMAN FACTORS ENGINEERING, 12, 14, 17, 18  
HUMAN PERFORMANCE, 11, 14

## I

IMMUNE SYSTEMS, 1  
IMMUNOLOGY, 1  
IN-FLIGHT MONITORING, 6  
INDEXES (DOCUMENTATION), 6  
INSECTS, 2  
IONIZATION, 3

## J

JOINTS (JUNCTIONS), 4

## L

LIFE (DURABILITY), 16  
LIFE SUPPORT SYSTEMS, 15  
LIQUID COOLING, 13  
LOCOMOTION, 17

## M

MAN MACHINE SYSTEMS, 9, 15  
MANAGEMENT SYSTEMS, 10  
MATHEMATICAL MODELS, 3, 5

MEDICAL EQUIPMENT, 14  
MEDICAL SERVICES, 6  
MICROINSTRUMENTATION, 2  
MICROORGANISMS, 7  
MICROPROCESSORS, 2  
MICROWAVE FREQUENCIES, 4  
MILITARY OPERATIONS, 10  
MISSION PLANNING, 16  
MOTION PERCEPTION, 15  
MOTION SICKNESS, 4

## **N**

NAVY, 12  
NETWORK ANALYSIS, 3  
NETWORKS, 10  
NIGHT VISION, 8  
NUCLEAR RESEARCH, 2  
NUMERICAL ANALYSIS, 5  
NUMERICAL CONTROL, 9

## **O**

OTOLITH ORGANS, 8

## **P**

PERCEPTUAL ERRORS, 15  
PERFORMANCE PREDICTION, 18  
PERFORMANCE TESTS, 13  
PERSONNEL DEVELOPMENT, 12, 16  
PHYSICAL EXERCISE, 7  
PHYSIOLOGICAL RESPONSES, 5  
PLANTS (BOTANY), 3  
POLICIES, 5, 9  
PREDICTION ANALYSIS TECHNIQUES, 18  
PROCEDURES, 12  
PRODUCT DEVELOPMENT, 16  
PRODUCTION MANAGEMENT, 2  
PROTECTION, 15  
PROTECTIVE CLOTHING, 14, 15  
PROTOTYPES, 10  
PSYCHOLOGICAL TESTS, 12  
PSYCHOLOGY, 8  
PUBLIC HEALTH, 5  
PULSE DURATION, 4

## **Q**

QUALIFICATIONS, 12  
QUALITY CONTROL, 2

## **R**

RADIATION PROTECTION, 2  
RADIATION THERAPY, 2  
RATIONS, 16  
REAL TIME OPERATION, 10  
REGULATIONS, 9  
RESEARCH, 5  
RESEARCH MANAGEMENT, 5  
RIBONUCLEIC ACIDS, 2  
ROBOT CONTROL, 17  
ROBOT DYNAMICS, 17  
ROBOTICS, 17

## **S**

SAFETY FACTORS, 18  
SEATS, 18  
SELF ALIGNMENT, 4  
SEMICIRCULAR CANALS, 8  
SENSITIVITY, 4, 8, 11  
SEQUENCING, 7, 13  
SHIVERING, 5  
SHOULDERS, 6  
SIMULATION, 5  
SOFTENING, 4  
SPACE SUITS, 14  
SPACECRAFT DESIGN, 16  
SPACECREWS, 7  
STIFFNESS, 18  
SYSTEMS SIMULATION, 9

## **T**

TARGET ACQUISITION, 15  
TASKS, 9  
TEAMS, 10, 11, 12  
TECHNOLOGY ASSESSMENT, 14  
TEMPERATURE CONTROL, 5  
THERMAL STRESSES, 13  
THERMOREGULATION, 5  
TIME OPTIMAL CONTROL, 13  
TRAINING ANALYSIS, 9, 10  
TRAINING DEVICES, 10  
TRAINING SIMULATORS, 10  
TRANSFER OF TRAINING, 9  
TURBINE BLADES, 17  
TWO DIMENSIONAL MODELS, 3

## **U**

URINE, 14

## **V**

VESTIBULES, 8  
VIBRATION ISOLATORS, 18  
VIRTUAL REALITY, 8  
VIRUSES, 1  
VISUAL ACUITY, 11  
VISUAL PERCEPTION, 11, 15  
VISUAL STIMULI, 15

## **W**

WASTE WATER, 13  
WATER IMMERSION, 5  
WATER TREATMENT, 13

# Personal Author Index

## A

Antonio, Joseph, 7  
Arndt, G. Dickey, 3  
Aylward, Mark, 10

## B

Barnard, Y. F., 10  
Basilio, Ralph R., 15  
Beer, N. Reginald, 3  
Bejczy, Antal K., 17  
Black, F. Owen, 8  
Bots, M. J., 11  
Bransdorfer, A. H., 14  
Brattin, Lori L., 14  
Brenner, Ingrid K., 5  
Broach, Dana, 12

## C

Canfield, Dennis V., 7  
Carl, James R., 3  
Castano, Rebecca, 2  
Castellani, John W., 5  
Chaturvedi, Arvind K., 7  
Cheung, B., 4

## D

Dean, Michelle, 12  
Dejohn, Charles A., 6  
Dolinar, Paul, 15

## E

Essens, P. J. M. D., 11, 12

## F

Fink, Patrick W., 3  
Foster, Philip P., 6  
Fritsch-Yelle, Janice, 6

## G

Gable, Beverly A., 14  
Garrett, Joan, 6  
Gor, Victoria, 3  
Green, Mavis F., 9

Greenisen, Michael, 6  
Greenisen, Michael C., 13  
Griffin, M. J., 17  
Griffioen-Young, H. J., 8

## H

Hemker, H. C., 5  
Hemker, P. W., 5  
Henry, Phillip D., 3  
Hoeksema-vanOrden, C. Y. D., 11  
Howard, Russell D., 13  
Hughes, Robert, 17  
Hvala, Nadja, 13

## J

Johnson, K. R., 14

## K

Kahn, R., 2  
Kalman, William G., 14  
Kaufman, Jonathan, 14  
Kline, Jane M., 14  
Kocijan, Jus, 13  
Kupfer, Doris M., 7

## L

Larcher, Julie G., 6  
Lee, Stuart M. C., 6, 13  
Lewis, C. H., 17

## M

Mann, Tobias, 2, 3  
Martin, T., 2  
Meyerowitz, Elliot, 3  
Miralles, C., 2  
Mjolsness, Eric, 2, 3  
Moore, Alan D., Jr., 6

## O

Oudenhuijzen, A. J. K., 16

## P

Pacifico, Antonio, 3

Pavselj, Natasa, 13  
Perkins, S. J., 1  
Post, W. M., 11  
Price, Kenneth, 17  
Provost, Scott, 14  
Pugh, John, 9

## R

Raffoul, George W., 3  
Rasker, P. C., 11  
Regan, David, 10  
Rice, Valerie J., 6  
Riemersma, J. B. J., 11  
Roe, Bruce A., 7  
Ros, Milenko, 13  
Rosenbaum, Bernard J., 4  
Rudolph, Joseph, 17  
Russell, Craig J., 12

## S

Sabel, A. A., 10  
Sawka, Michael N., 5  
Schaafstal, A. M., 11  
Schneider, Suzanne M., 6, 13  
Sharp, Marilyn A., 6  
Shek, Pang N., 5  
Smith, David W., 6  
Soper, John W., 7  
Stortelder, W. J. H., 5  
Sullivan, John M., 8

## T

Taylor, Christopher R., 14  
Thakoor, S., 2  
Tharion, William J., 6  
Tucker, Heather D., 14  
Turano, Kathleen A., 15

## V

vanBaar, B. L., 3  
vanBoxtel, L. B. J., 16  
vanDelft, J. H., 12  
vanderHulst, A. H., 10  
Veronneau, Stephen J. H., 6  
Verstegen, D. M. L., 10  
Vu, Nicole T., 7

## **W**

Wei, L., 17  
White, David, 9  
Williamson, Tania, 6  
Wolbrink, Alex M., 6  
Wold, Barbara, 2  
Wood, Simon J., 9  
Woodruff, Kristin K., 13

## **Y**

Young, Andrew J., 5

## **Z**

Zurek, R., 2

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